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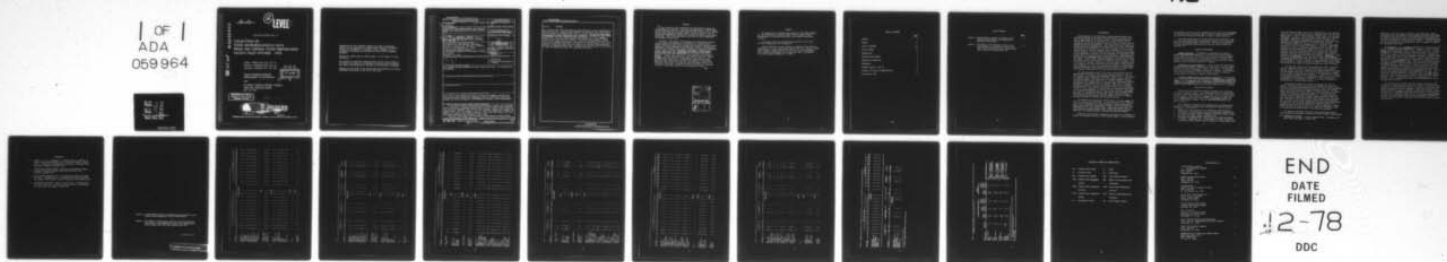
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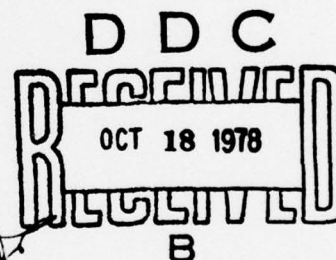
COLLECTION OF
FOOD MICROBIOLOGICAL DATA
FROM THE CENTRAL FOOD PREPARATION
FACILITY PILOT KITCHEN - 1976

JOHN T. FRUIN, DVM, Ph.D., LTC, VC
HARVEL F. ALISHOUSE, MPH, MAJ, VC
AVALON L. DUNGAN, Ph.D., LTC, QM

FOOD HYGIENE DIVISION
DEPARTMENT OF NUTRITION

and

US ARMY, TROOP SUPPORT AGENCY
FORT LEE, VIRGINIA 23801
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ABSTRACT

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ABSTRACT

A food quality control laboratory was established to assess the wholesomeness of foods and to formulate microbiological criteria based on data collected from food items prepared under the Fort Lee, Virginia, Central Food Preparation System (CFPS). The CFPS concept is one of centralized preparation, storage, and delivery of foods to unit dining facilities. Unit level food service will provide final preparation and serving of these foods.

Routinely, food samples were obtained at predetermined critical control points and delivered to the laboratory. Special discretionary sampling occurred when problems were identified during routine sampling or as the consequence of analytical results. Analyses were conducted in accordance with normal laboratory procedures to determine aerobic plate, coliform, Clostridium perfringens, Staphylococcus aureus, Escherichia coli, Salmonella, and yeast and mold counts. Approximately 1% of all samples analyzed had greater than 100 S. aureus/g. Slightly more than half of the samples were analyzed for E. coli. Of those analyzed for E. coli 14% were positive. Other microbiological data were of lesser public health significance. Because of the diverse types of food items examined, insufficient data have been collected to establish microbiological criteria for individual food items. Analyses and data collection will continue in order to establish criteria for individual food items.

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PREFACE

The authors wish to express appreciation to LTC Robert Howarth for the development of sampling plans, critical control points, establishment of laboratory procedures, and microbial guideline criteria.

The authors also wish to express appreciation to Mrs. Karen Trefz for preparation of the manuscript.

Author Alishouse's current address is Veterinary Staff Office, Headquarters U.S. Army Troop Support Agency, Fort Lee, Virginia 25801. Author Dungan's current address is HQDA, Office of the Department Chief, Research Development and Acquisitions, ATTN: DAMA-CSS-D/LTC Avalon Dungan, Washington, DC 20310.

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INTRODUCTION

The Department of the Army (DA) provides prepared meals for a significant portion of the active duty personnel at an annual food cost of approximately 250 million dollars. Traditionally, during periods when troops are in garrison, this service is provided by individual unit dining facilities which are tailored to meet specific command and mission requirements. Unit dining facilities operate in a semi-autonomous atmosphere even though there may be many comparable facilities at an installation. The primary responsibility for food service falls on the unit commander and, subsequently, the unit food service sergeant. The unit dining facility is credited for assisting in the maintenance of morale, in the development of camaraderie among troops, and as a training base for field operations. Unfortunately, failures in the management and/or operation of unit dining facilities are common. These failures manifest themselves in many ways, but all too often they are in the form of a foodborne illness outbreak. Due to the lack of personnel resources at the unit level, complete corrective action in the face of failure may be impossible. Additionally, unit commanders are faced with increasingly complex and sophisticated mission requirements which detract from their ability to have extensive personal involvement in the unit food service facility.

The semi-autonomous nature of the unit dining facility and the questionable efficiency of unit dining facility operations led to the proposal of a Central Food Management System (CFMS). This concept is currently under evaluation by the Troop Support Agency (TSA) at Fort Lee, Virginia. CFMS provides for a single management element, the Central Food Manager (CFM), for all garrison dining facilities as designated by the installation or command. Under the CFMS concept, the CFM is responsible for all food service facilities, equipment, maintenance, utility conservation, contract, Troop Issue Subsistence Activity (TISA), operation of Centralized Food Preparation Facilities (CFPF) and menu management, as well as for the operation, management and control of designated Table of Distribution and Allowances (TDA) and Table of Organization and Equipment (TO&E) dining facilities. CFMS provides an organization with the degree of depth in technical expertise required to operate unit dining facilities.

The Central Food Preparation System (CFPS) is a major element of CFMS to be evaluated at Fort Lee. In the evaluation of the CFMS concept, TSA was concerned with the maintenance of food wholesomeness during centralized food preparation, storage, distribution and final preparation at the unit service level. Large scale preparation of menu items that require minimal final cooking and storage presents a potential for installation-wide outbreaks of foodborne disease.

Within the Fort Lee CFMS, provisions were made for a laboratory to monitor the microbial quality of CFPS prepared foods. This laboratory

was located at Fort Lee so that samples could be collected and delivered to the laboratory for analysis, and the results reported more quickly than would be possible by utilizing a remotely located laboratory.

This report summarizes the microbiological data generated by the Fort Lee Food Quality Control Laboratory in support of the pilot CFPF since it became operational in early 1976. The data were tabulated by using the computer program and data analysis system previously described (1).

MATERIALS AND METHODS

Sample Collection: Food samples were aseptically collected during processing and preparation at critical control points specified in CFMF HAD 75-01 (2), as well as at specific points determined by the sample collector, and from finished products. Samples were sealed in sterile containers and maintained in a chilled state before delivery to the laboratory and prior to analysis.

Preparation of Food Homogenate: A 100 g portion was aseptically removed from each sample. Fifty g were weighed into a sterile blender and 450 ml of sterile phosphate buffered water added. The combined sample and diluent were blended together for 2 minutes. The remaining 50 g portion was placed in 450 ml of lactose broth for salmonella pre-enrichment and shaken to prepare the homogenate.

Isolation, Identification and Counting Procedures: The procedures given in the Food and Drug Administration's Bacteriological Analytical Manual (3) for Escherichia coli, Salmonella, Staphylococcus aureus, and Clostridium perfringens isolation and identification, and for coliform counts, aerobic plate counts, and yeast and mold counts were followed.

RESULTS AND DISCUSSION

During 1976, 1141 individual samples representing 99 different types of foods were analyzed. The following numbers of analyses were performed: 1136 for aerobic plate count (APC), 1133 for coliform most probable number (MPN), 1060 for S. aureus MPN, 626 for E. coli MPN, 28 for Salmonella determinations, 6 for C. perfringens counts, and 16 for yeast and mold counts. Data by food type and analysis are shown in Table 1.

Four categories of interim CFPF microbiological guidelines were adopted (3). These categories were formulated by using the sample

1. Fowler, J.L. et al, Report No. 27, Presidio of San Francisco, California: Letterman Army Institute of Research, November 1975
2. US Army Troop Support Agency, Laboratory Procedures Manual Number HAD 75-01, Fort Lee, Virginia, November 1974
3. Food and Drug Administration, Bacteriological Analytical Manual for Foods. Washington, DC: US Department of Health, Education and Welfare, Public Health Service, Division of Microbiology, 1971

size and rejection number specified in MIL-STD-105D (4) for sampling plans S1 or S2, the choice of which is dependent upon the food item being tested. The four CFPF guideline criteria were: (a) precooked vegetables, red meats, poultry, entrees, salad ingredients, gravies and soups: negative for E. coli/g and an APC of not more than 100,000/g; (b) desserts (ready to eat puddings and cream-type pies): negative for E. coli/g and an APC of not more than 50,000/g; (c) vegetable salads (raw vegetables only): negative for E. coli/g and an APC of not more than 10,000,000/g; (d) prepared sandwiches: components conform to applicable guidelines (a) or (c) above. For foods in all four categories, trigger criteria for APCs and fecal coliforms in excess of 10,000/g and 3.6/g, respectively, were prescribed. When the trigger criteria were exceeded, the following additional analyses and guidelines were supplied: Salmonella - negative/25 g; C. perfringens - not more than 1,000/g; and S. aureus (coagulase positive) - not more than 100/g. These additional analyses and guidelines could also be applied at the discretion of the appropriate authority. Table 2 displays the number of food samples tested that exceeded the respective non-conformance and suspect criteria.

For some food classes, the data presented in Table 2 indicate that the guideline criteria for individual samples was exceeded. However, because lot size is unknown in the data presented for analysis and because these data do not indicate whether multiple samples from the same lot exceeded the criteria, it is impossible to discern if any product actually was non-conforming. Whether or not a product is wholesome and suitable for consumption is most appropriately determined by a knowledgeable official at the time of analysis by consideration of all pertinent factors.

The suspect criterion for coliform organisms which require samples to undergo additional analysis was exceeded by nearly one-third of the cheese samples and one-fourth of the pork samples examined. Pork and sausage products exceeded the aerobic plate count suspect levels for a relatively large number of samples; however, the suspect levels established for these items appear to be unrealistic when compared to previously published reports (1). The high numbers of coliform counts exceeding the suspect criterion found in these two food classes were identified as being diced cheddar cheese and diced ham. The value of an onsite quality control laboratory integrated into an alert overall quality assurance program was demonstrated when the source of this coliform contamination was determined to be a commercial meat dicer which could not be properly sanitized. Appropriate actions were taken by the CFM to notify the manufacturer and to preclude future procurements of the unsuitable equipment.

The degree of diversity among food items within some product classes makes microbiological criteria for entire classes inappropriate.

4. Department of Defense. Military Standard 105D. Washington, DC, April 1963, and Change 1, March 1964

Therefore, closer monitoring of sampling, including more complete identification of lot numbers, point of sample collection, and reason for sample collection and type of microbial analysis performed would provide data having more value in the evaluation of wholesomeness and for the establishment of microbiological criteria. Continued analysis and data collection will be necessary in order to establish criteria for individual food items.

No Salmonella or C. perfringens organisms were isolated from the 28 and 6 samples analyzed, respectively. However, 13 of the 1063 S. aureus MPN determinations yielded counts of 100/g or more. Of these 13 samples, 4 were cheddar cheese, 5 were diced ham, 2 were sliced salami, 1 was carrot + raisin salad, and 1 was pickle + pimento loaf. All of these food items or their components possess a relatively high salt content and/or a low water activity. Both of these factors are tolerated well by S. aureus and are responsible for selectively inhibiting the competing normal flora. None of the 13 samples yielding S. aureus contained enough organisms to produce foodborne staphylococcal intoxication. However, their presence at greater than 100/g presents a potential health hazard in a mass feeding system if subsequent growth results in sufficient toxin production. Eighty-six (14%) of the 626 samples analyzed for E. coli were positive. Of the 62 cole slaw samples analyzed, 60 were positive for E. coli. The only other food item showing a significant level of E. coli contamination was cheddar cheese, which yielded 15 positives of 31 samples analyzed. Such a high isolation rate of E. coli indicates a continuing source of contamination either of the ingredients or in the preparation of the item.

Even though this extensive analysis program revealed no food samples which contained either the type or number of organisms which represent an immediate health hazard, one percent of the samples contained potentially hazardous organisms. Over eight percent of the samples contained E. coli, an organism frequently attributed to fecal contamination. Considering that the Fort Lee CFPF is the prototype for future troop feeding systems within DA, continued microbiological analyses at an even higher frequency are recommended to determine suitable microbiological criteria for this and future CFPF's at other installations.

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2. US ARMY TROOP SUPPORT AGENCY. Central Food Management System, Laboratory Procedures Manual Number HAD 75-01, Fort Lee, Virginia, November 1974
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4. DEPARTMENT OF DEFENSE. Military Standard 105D. Sampling Procedures and Tables for the Inspection by Attributes. Washington, DC, April 1963, and Change 1, March 1964

TABLE 1. Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen

TABLE 2. The number of food samples, listed by food classification, which failed to meet guideline criteria when analyzed for aerobic plate count (APC) and coliform count (CC)

A P P E N D I X

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen

FOOD ITEM	Aerobic Plate Count x 1000/r														Coliforms/r													
	3-		11-		21-		31-		41-		51-		61-		71-		81-		91-		100-		>100					
	N	<3	10	20	30	40	50	60	70	80	90	100	>100	N	<10	11-	21-	31-	41-	51-	61-	71-	81-	91-	100-	>100		
BATTERY PRODUCTS																												
Apple Pie	3	2	1	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0		
Blueberry Pie	7	6	1	0	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	0	1	2	0		
Brownies	2	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0		
Butterscotch Brownies	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Cherry Pie	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0		
Danish Pastry	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Doughnut	5	4	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0	0	1	0	0	2	0	0		
Jelly Roll	2	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0		
Lemon Jelly Roll	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0		
Peach Pie	6	5	0	0	0	0	0	0	0	0	0	0	1	6	4	0	0	0	0	0	0	0	0	2	0	0		
Pineapple Cake	2	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0		
Raisin Pie	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Yellow Cake	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Maple Icing	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0		
DEEF																												
Barbequed Spare Ribs + Sauce	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Hamburger	2	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0		
Salisbury Steak	10	6	1	1	0	1	0	0	0	0	0	0	1	10	8	0	0	0	0	0	0	0	0	0	2	0		
Swiss Steak	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
CHESSE																												
American Cheddar	3	3	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0		
Cheddar + Swiss	67	11	2	1	0	2	0	0	0	0	0	0	51	66	41	4	3	0	4	0	1	0	0	7	6	0		
Diced	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Cheddar Diced	45	7	2	0	1	0	1	0	0	0	0	0	34	46	43	0	1	0	0	0	0	0	0	2	0	0		
Cheddar Shredde1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Cheese	2	0	1	0	0	0	0	0	0	0	0	0	1	2	1	0	1	0	0	0	0	0	0	0	0	0		
Diced	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0		
Grated	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0		
Mixed	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0		
Swiss	15	15	0	0	0	0	0	0	0	0	0	0	0	15	11	0	1	0	0	0	0	0	0	3	0	0		
Swiss Jiced	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
CHILI																												
Chili	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
FRUIT																												
Apples Diced	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0		
Pineapple	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen (Cont)

FOOD ITEM	S. aureus Count/n			C. perfringens Count/n			Yeast + Mold Count/n			Salmonella		E. coli				
	N	<100	≥100	N	<100	≥100	N	<10	10-100	>100	N	POS	NEG	N	POS	NEG
BAKERY PROD.																
Apple Pie	3	3	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Blueberry Pie	7	7	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Brownies	2	2	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Butterscotch Brownies	0	-	-	0	-	-	0	-	-	-	0	-	-	0	-	-
Cherry Pie	0	-	-	0	-	-	0	-	-	-	0	-	-	0	-	-
Danish Pastry	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Doughnut	4	4	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Jelly Roll	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Lemon Jelly Roll	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Peach Pie	6	6	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Pineapple Cake	2	2	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Raisin Cake	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Yellow Cake	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Maple Icing	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
BEEF																
Barbeque Spare Ribs + Sauce	1	1	0	1	1	0	0	-	-	-	1	0	1	0	-	-
Hamburger	2	2	0	0	-	-	0	-	-	-	0	-	-	2	1	1
Salisbury Steak	10	10	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Swiss Steak	1	1	0	1	1	0	0	-	-	-	1	0	1	0	-	-
CHIEF																
American Cheddar	3	3	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Cheddar + Swiss Diced	63	59	4	0	-	-	8	7	0	1	14	0	14	31	15	16
Cheddar Shredded	43	43	0	0	-	-	2	2	0	0	0	-	-	0	-	-
Cheese Diced	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Grated	0	-	-	0	-	-	0	-	-	-	0	-	-	1	0	1
Mixed Swiss	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Swiss Diced	15	15	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Swiss Diced	1	1	0	0	-	-	0	-	-	-	0	-	-	2	0	2
CHILI																
Chili	1	1	0	1	1	0	0	-	-	-	1	0	1	0	-	-
FRUIT																
Apples Diced	0	-	-	0	-	-	0	-	-	-	0	-	-	0	-	-
Pineapple	0	-	-	0	-	-	0	-	-	-	0	-	-	0	-	-

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen (Cont)

FOOD ITEM	Aerobic Plate Count x 1000/g														Coliforms/g													
	N	<3	3-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100	N	<10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100			
LUNCHEON MEATS																												
Pickle + Pimento Loaf	63	26	2	2	4	3	1	2	1	0	0	1	21	63	57	1	1	1	0	0	0	0	0	0	0	3		
PORK																												
Bacon	4	4	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0		
Bacon Sliced	15	14	0	1	0	0	0	0	0	0	0	0	0	15	15	0	0	0	0	0	0	0	0	0	0	0		
Ham	2	2	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1		
Ham Diced	117	96	7	2	2	1	0	0	0	0	0	0	9	113	73	7	7	4	3	0	2	1	0	2	19			
Ham Sliced	63	51	6	2	2	0	0	0	0	0	1	0	6	63	52	1	2	1	1	0	0	0	1	1	4	0		
Ham Steak	2	2	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0		
POULTRY																												
Chicken Parmesan	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-		
MISC																												
Chop Suey Pork	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Meat Loaf	8	5	2	0	1	0	0	0	0	0	0	0	0	8	5	1	0	0	0	0	0	1	0	0	1	0		
Spanish Rice	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
SALADS																												
Banana Jello	7	6	0	0	0	0	0	0	0	0	0	1	0	7	7	0	0	0	0	0	0	0	0	0	0	0		
Bean	2	1	1	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	1	0	1	0		
Cabbage + Carrot	4	1	0	0	1	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0		
Cabbage + Celery	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
Cabbage + Cole Slaw	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
Carrot + Celery	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1		
Carrot + Raisin	39	10	2	3	7	3	4	1	2	1	0	0	6	39	12	0	3	0	1	0	0	0	0	0	2	21		
Carrot + Raisin + Celery	15	5	0	0	0	1	0	0	1	0	1	0	7	15	4	1	0	0	0	0	0	0	0	1	9	0		
Chef	23	0	0	0	3	1	1	2	1	0	0	1	14	23	2	0	2	1	0	0	0	0	0	0	18	0		
Cole Slaw	73	6	10	7	10	4	2	1	3	0	3	1	26	73	12	2	7	0	3	0	0	1	0	8	40	0		
Cranberry + Pineapple	14	14	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	0	0		
Fruit Cocktail	14	14	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	0	0		
Fruit Gelatin	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Garden	32	1	1	0	1	1	0	0	0	0	1	1	26	32	2	0	2	0	0	0	0	0	0	2	26	0		
Golden Glow	11	11	0	0	0	0	0	0	0	0	0	0	0	11	11	0	0	0	0	0	0	0	0	0	0	0		
Jello	2	2	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0		
Lemon Jello	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Lettuce	23	1	3	3	0	0	1	0	0	0	0	0	15	23	3	1	2	0	0	0	0	0	0	0	0	17		
Lettuce + Cucumber	13	1	1	0	0	0	0	0	1	0	0	1	0	13	1	0	0	2	0	0	0	0	0	0	8	0		
Lettuce + Onion	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0		
Lettuce + Tomato	6	2	0	0	0	0	0	1	0	0	0	0	3	6	3	0	1	0	0	0	0	0	0	1	1	1		
Meat + Cheese	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
Melba Jello	4	4	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0		
Orange Pineapple	10	10	0	0	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0		

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen (Cont)

FOOD ITEM	S. aureus Count/g			C. perfringens Count/g			Yeast + Mold Count/m			Salmonella		E. coli				
	N	<100	≥100	N	<100	≥100	N	<10	10-100	>100	N	POS	NEG	N	POS	NEG
LUNCHEON MEATS																
Pickle + Pimento Loaf	55	54	1	0	-	-	0	-	-	-	4	0	4	33	0	33
PORK																
Bacon	4	4	0	0	-	-	0	-	-	-	0	-	-	4	0	4
Bacon Sliced	15	15	0	0	-	-	0	-	-	-	3	0	3	7	0	7
Ham	2	2	0	0	-	-	0	-	-	-	0	-	-	2	0	2
Ham Diced	112	107	5	0	-	-	0	-	-	-	0	-	-	75	1	74
Ham Sliced	64	64	0	0	-	-	0	-	-	-	0	-	-	39	0	39
Ham Steaks	2	2	0	0	-	-	0	-	-	-	0	-	-	1	0	1
POULTRY																
Chicken Parmesan	1	1	0	1	1	0	0	-	-	-	1	0	1	1	0	1
MISC																
Chop Suey Pork	1	1	0	1	1	0	0	-	-	-	1	0	1	0	-	-
Meat Loaf	8	8	0	0	-	-	0	-	-	-	0	-	-	8	1	7
Spanish Rice	1	1	0	0	-	-	0	-	-	-	1	0	1	0	-	-
SALADS																
Banana Jello	7	7	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Bean	2	2	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Cabbage + Carrot	4	4	0	0	-	-	0	-	-	-	0	-	-	4	0	4
Cabbage + Celery	1	1	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Cabbage + Cole Slaw	1	1	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Carrot + Celery	1	1	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Carrot + Raisin	36	35	1	0	-	-	0	-	-	-	0	-	-	32	0	32
Carrot + Raisin + Celery	15	15	0	0	-	-	0	-	-	-	0	-	-	13	1	12
Chef	23	23	0	0	-	-	0	-	-	-	0	-	-	22	1	21
Cole Slaw	68	68	0	0	-	-	0	-	-	-	0	-	-	62	60	2
Cranberry + Pineapple	7	7	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Fruit Cocktail	14	14	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Fruit Gelatin	0	-	-	0	-	-	0	-	-	-	0	-	-	0	-	-
Garden	27	27	0	0	-	-	0	-	-	-	0	-	-	27	1	26
Golden Glow	10	10	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Jello	2	2	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Lemon Jello	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Lettuce	20	20	0	0	-	-	0	-	-	-	0	-	-	17	2	15
Lettuce + Cucumber	13	13	0	0	-	-	0	-	-	-	0	-	-	13	0	13
Lettuce + Onion	1	1	0	0	-	-	0	-	-	-	0	-	-	1	0	1
Lettuce + Tomato	6	6	0	0	-	-	0	-	-	-	0	-	-	6	0	6
Meat + Cheese	1	1	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Malba Jello	4	4	0	0	-	-	0	-	-	-	0	-	-	0	-	-
Orange Pineapple	10	10	0	0	-	-	0	-	-	-	1	1	0	0	-	-

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen (Cont.)

FOOD ITEM	N	Aerobic Plate Count											Coliforms/g											
		3-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100	
		SALADE (Cont)																						
Peach Jello	10	10	0	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0
Pear Jello	20	19	1	0	0	0	0	0	0	0	0	0	22	21	1	0	0	0	0	0	0	0	0	0
Perfection	22	22	0	0	0	0	0	0	0	0	0	0	22	21	1	0	0	0	0	0	0	0	0	0
Pineapple Banana	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Pineapple Lettuce	5	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0
Cheese	2	0	0	0	0	0	0	0	0	0	0	7	2	2	0	0	0	0	0	0	0	0	0	0
Jello	9	0	1	0	0	0	0	0	0	0	0	7	9	5	1	0	0	0	0	0	0	0	0	3
Pineapple Cheese	8	8	0	0	0	0	0	0	0	0	0	0	8	7	1	0	0	0	0	0	0	0	0	0
Pineapple Pear	4	4	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0
Banana	5	5	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0
Spiced Cherry Jello	23	0	1	2	0	0	0	0	0	0	0	20	23	1	0	0	0	3	0	0	0	0	1	18
Spiced Peach	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Spring	6	6	0	0	0	0	0	0	0	0	0	0	6	5	0	1	0	0	0	0	0	0	0	0
Strawberry +	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Banana	6	6	0	0	0	0	0	0	0	0	0	0	6	5	0	0	0	0	0	0	0	0	1	1
Strawberry Pine-	19	11	2	1	3	0	0	0	0	0	0	0	19	15	1	0	0	0	0	0	0	0	0	3
apple Banana	40	0	0	2	0	2	0	1	0	2	1	30	40	5	3	1	0	1	0	0	0	0	1	29
Three Bean	15	1	0	2	1	0	0	1	0	0	1	9	15	2	0	0	0	0	0	0	0	0	2	11
Tossed	6	4	1	1	0	0	0	0	0	0	0	0	6	5	0	1	0	0	0	0	0	0	0	0
Tossed Vegetable	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Vegetable Mari-	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
nated	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meat	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAUCES																								
Bologna	23	19	1	2	0	0	0	0	0	0	0	0	23	21	0	1	0	0	0	0	0	0	0	1
Bologna Diced	3	1	1	0	0	0	0	0	0	0	0	1	3	3	0	0	0	0	0	0	0	0	0	0
Bologna Sliced	51	27	2	3	1	0	1	0	1	0	1	15	51	50	0	0	0	1	0	0	0	0	0	0
Salami	8	4	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0
Salami Diced	10	6	2	0	1	0	0	0	0	0	0	1	10	10	0	0	0	0	0	0	0	0	0	0
Salami Sliced	54	24	13	3	2	3	0	1	0	1	0	6	54	52	0	0	1	0	1	0	0	0	0	0
TOPPING																								
Cherry	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Chocolate	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Vanilla	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0

TABLE 1: Microbiological results of analyzing foods prepared in the Central Food Preparation Facility Pilot Kitchen (Cont)

FOOD ITEM	<u>S. aureus</u> Count/r		<u>C. perfringens</u> Count/r		Yeast + Mold Count/r			<u>Salmonella</u>		<u>E. coli</u>	
	N	<100	≥100	N	<100	≥100	10-100	>100	N	POS	NEG
<u>SALADS (Cont)</u>											
Peach Jello	10	10	0	0	-	-	-	-	0	-	7
Pear Jello	20	20	0	0	-	-	-	-	0	-	6
Perfection	14	14	0	0	-	-	-	-	0	-	4
Pineapple Banana	1	1	0	0	-	-	-	-	0	-	0
Pineapple Lettuce											
Cheese	5	5	0	0	-	-	-	-	0	-	3
Pineapple Pear											
Jello	2	2	0	0	-	-	-	-	0	-	0
Pineapple Cheese	3	3	0	0	-	-	-	-	0	-	7
Pineapple Pear											3
Banana	8	3	0	0	-	-	-	-	0	-	0
Spiced Cherry Jello	4	4	0	0	-	-	-	-	0	-	0
Spiced Peach	5	5	0	0	-	-	-	-	0	-	0
Spring	22	22	0	0	-	-	-	-	0	-	22
Strawberry +											1
Banana	1	1	0	0	-	-	-	-	0	-	0
Strawberry Pine-											
apple Banana	6	6	0	0	-	-	-	-	0	-	0
Three Bean	19	19	0	0	-	-	-	-	0	-	11
Tossed	40	40	0	0	-	-	-	-	0	-	40
Tossed Vegetable	15	15	0	0	-	-	-	-	0	-	15
Vegetable Mari-											
nated	6	6	0	0	-	-	-	-	0	-	2
<u>SAUCES</u>											
Meat	1	1	0	1	1	0	-	-	1	0	1
<u>SAUSAGE</u>											
Bologna	22	22	0	0	-	-	-	-	0	-	7
Bologna Diced	3	3	0	0	-	-	-	-	0	-	2
Bologna Sliced	52	52	0	0	-	-	-	-	0	-	37
Salami	6	6	0	0	-	-	-	-	0	-	3
Salami Diced	10	10	0	0	-	-	-	-	0	-	5
Salami Sliced	49	49	2	0	-	-	-	-	0	-	33
<u>TOPPING</u>											
Cherry	1	1	0	0	-	-	-	-	0	-	0
Chocolate	2	2	0	0	-	-	-	-	0	-	0
Vanilla	1	1	0	0	-	-	-	-	0	-	0

TABLE 2: The number of food samples, listed by food classification, which failed to meet guideline criteria when analyzed for aerobic plate count (APC) and coliform count (CC)

Food Classification	Guideline* Category	Samples Analyzed for APC			Samples Analyzed for CC			Other Significant Results
		Number Samples Analyzed	Number* Samples Exceeding Guideline	Number* Samples Exceeding Trigger Criterion	Number Samples Analyzed	Number* Samples Exceeding Trigger Criterion		
Bakery Products	b	33	1	1	35	10	None	
Beef	a	14	1	2	14	4	1 Sample - <u>E. coli</u> Positive	
Cheese	d	**	**	**	138	45	4 Samples \geq 100 <u>S. aureus/g</u> 15 Samples - <u>E. coli</u> Positive	
Chili	d	1	0	0	1	0	None	
Fruit	a	2	0	0	1	1	None	
Luncheon Meats	a	**	**	**	63	6	1 Sample \geq 100 <u>S. aureus/g</u> 5 Samples \geq 100 <u>S. aureus/g</u>	
Pork	d, a	208	15	26	204	54	1 Sample - <u>E. coli</u> Positive	
Poultry	a	1	0	0	0	0	None	
Miscellaneous	a	10	0	1	10	3	1 Sample - <u>E. coli</u> Positive	
Salads	c	495	0	50	***		1 Sample \geq 100 <u>S. aureus/g</u> 69 Samples - <u>E. coli</u> Positive	
Sauces	a	1	0	0	0	0	None	
Sausage	d***	149	17	27	149	3	2 Samples \geq 100 <u>S. aureus/g</u>	
Topping	a	4	0	0	4	0	None	
Vegetables	c	17	2	0	17	0	None	

* Guideline and trigger criteria described in Results and Discussion

** Not applicable to cultured product.

*** No criteria.

**** Total number of samples analyzed, but only non-cultured items reported as exceeding guidelines.

GLOSSARY OF TERMS AND ABBREVIATIONS

APC - Aerobic Plate Count	g - Gram
CC - Coliform Count	ml - Milliliter
CFM - Central Food Manager	MPN - Most Probable Number
CFMS - Central Food Management System	TDA - Table of Distribution and Allowances
CFPF - Central Food Preparation Facility	TISA - Troop Issue Subsistence Activity
CFPS - Central Food Preparation System	TO&E - Table of Organization and Equipment
DA - Department of Army	TSA - Troop Support Agency

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